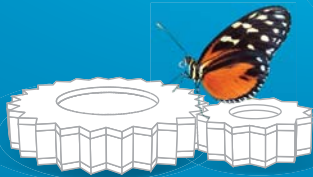


GFM

Series VRLA Battery



shoto

power the future





1. Introduction

The "Shoto" brand GFM series VRLA batteries are products of the latest technologies. The products are in line with the YD/T799-2002 standard of the Ministry of Information Industry of China, the JISC8704-2:1999 standard of Japan and the IEC60896-2 standard. All of its performance indices have reached advanced level in China and enjoy good reputation both at home and abroad. The products can be widely used as backup power for telecommunication and signal systems of telecom, mobile, railway system, shipping, utility and nuclear power plants, solar energy and wind energy storage systems as well as UPS and emergency lighting.

2. Product Characteristics

- The plate is with the structure of big grid and block, and is made of special alloy through special process of quadribasic lead sulfate, which improves specific energy of the battery and prolongs the cycle service life.
- Positive grid (patent: ZL 01 2 72477.7) is made of special multi alloy (patent: ZL 02 1 38120.X), which prevent PCL. It has long service life under both float and cycle applications.
- Separator: made of AGM(patent: ZL 01 1 27020.9), low internal resistance and good high rate discharging performance.
- Active materials (patent: ZL 02 1 12897.9): Special additive has been added into the lead paste of positive and negative plate, so that the utilization rate of active materials will become high and it will improve the charge acceptability.
- High-purity electrolyte (patent: ZL 02 1 12896.0): High purity electrolyte and special additive are used, which lead to low self-discharge.

- Special terminal sealing structure (patent: ZL 02 2 20024.X): Unique assembled maze seal structure of terminal (patented technology) ensures the safety and reliability of seal.
Safe valve structure (patent: ZL 00 2 41118.0): the valve is made of FR ABS materials. The valve core is in column structure, there is dual-filtering acid mist filters. It has the function of correctly controlling the pressure, flame resistance and acid mist filtering when valve open and close.
- Adopt U double-layer longitudinal pattern and tight assembly technology to prevent plate stress from affecting separator elasticity. Large-diameter copper core is applied, the terminals and comb teeth are die casted together, which makes the internal resistance lower.
- Short circuit protection: plastic sleeve (patent: ZL 02 3 17823.X) is added for plate, so as to effectively avoid the short circuit of the positive and negative plate, and to avoid the bend and distortion in the horizontal installation.
- Battery case (patent: ZL 00 2 40666.7): made of super strong ABS materials (Flame retardant UL94_V0 optional). It is sealed through patent technology of heat sealing (patent: ZL 02 2 19847.4), and has the characteristic of attractive appearance, reliable structure and sealing.
- Inert gas protect welding is used, special glue is applied for the second sealing to ensure no leakage.
- Single cell structure: the single cell structure of "shoto" GFM series with the max capacity up to 3000Ah, offering the customers more choices.
- System structure: "Shoto" GFM VRLA battery can be installed in cabinet, on rack and floor thermal dissipation space has been laid out to effectively avoid thermal runaway.

3. Main Technical Parameters

➤ **Designed life**

Float charge life 15years (normal use at 25℃, fully charged)

➤ **Charge acceptability**

Test method: After the battery is discharged to 100% DOD, charge it for 10h at 2.35V/cell constant voltage limited current 0.15C₁₀(A), the capacity shall be recharged over 98% of the discharged capacity.

➤ **Recombination efficiency** over 99%.

➤ **Capacity retention rate** after 90 days in stock, the rest capacity shall be over 90%

➤ **Rated capacity**

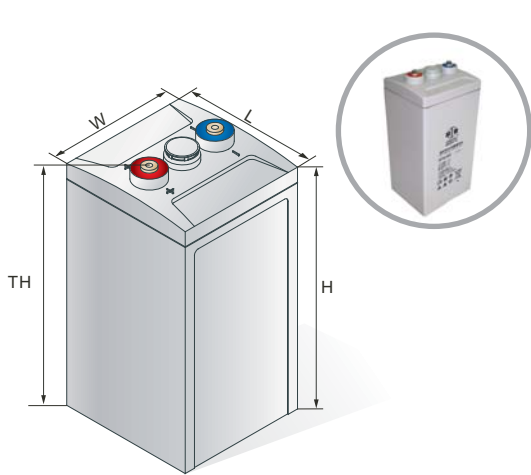
10h rated capacity	0.1C ₁₀ A discharge till end voltage 1.80V/cell	C ₁₀
3h rated capacity	0.25C ₁₀ A discharge till end voltage 1.80V/cell	0.75 C ₁₀
1h rated capacity	0.55C ₁₀ A discharge till end voltage 1.75V/cell	0.55 C ₁₀

➤ **Capacity recovery performance** (short circuit performance)

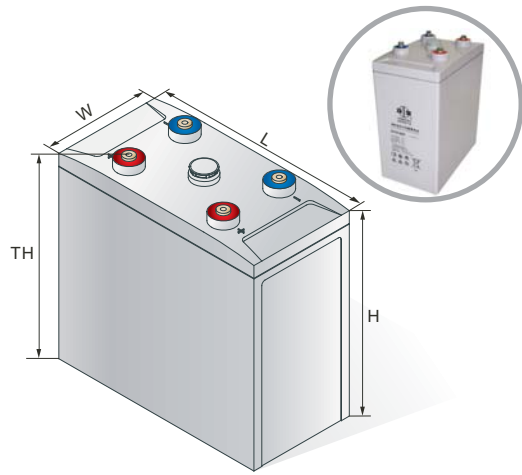
Test method: Discharge to 0V at 0.1C₁₀A, short circuit for 24h, charge for 10h with 2.35V/cell constant voltage and limited current 0.15C₁₀(A), and then charge for 24h with 2.25V/cell constant voltage and limited current 0.15C₁₀(A), check C₁₀ capacity, after continuous 5 times, the rest capacity shall not be less than 90% of the initial capacity.

4. Specifications and type

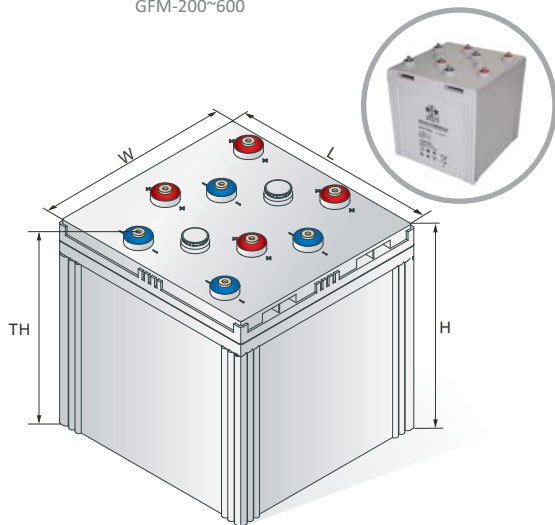
Type	Rated Voltage (V)	Rated capacity				Dimension(mm)				Weight (Kg)
		C ₂₀ Vt=1.80V/cell	C ₁₀ Vt=1.80V/cell	C ₃ Vt=1.8V/cell	C ₁ Vt=1.75V/cell	L	W	H	Total Height	
GFM-200	2	206	200	150	110	90	181	346	365	13.7
GFM-300	2	309	300	220	165	124	181	346	365	19.2
GFM-400	2	412	400	300	220	158	181	346	365	25
GFM-500	2	515	500	375	275	191	181	346	365	30.5
GFM-600	2	618	600	450	330	225	181	346	365	35.5
GFM-800	2	824	800	600	440	303	181	346	365	48
GFM-1000	2	1030	1000	750	550	370	181	346	365	61
GFM-1600	2	1648	1600	1200	880	318	363	369	388	100
GFM-2000	2	2060	2000	1500	1100	385	363	369	388	125
GFM-3000	2	3090	3000	2250	1650	568	363	369	388	185



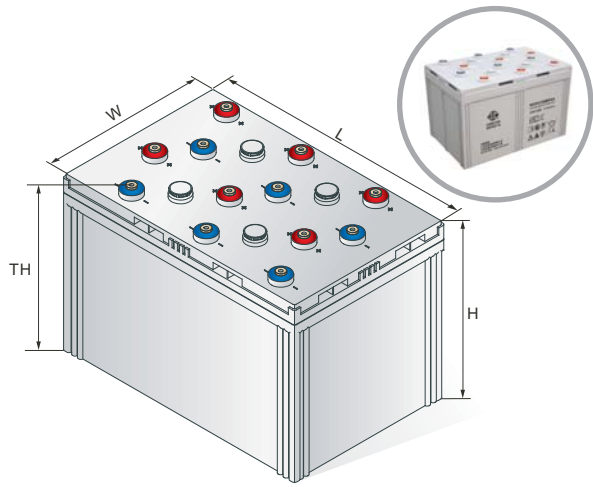
GFM-200~600



GFM-800~1200



GFM-1600~2000



GFM-3000

5. Battery installation configuration

> Vertical (48V200~3000Ah)

Model	Installation config.	Rack specifications L × W × H (mm)	MAX specifications L × W × H (mm)	Total weight (Kg) Battery included
48V200Ah	Single-layer vertical	1416 × 460 × 341	1476 × 480 × 409	350
	Double-layer vertical	712 × 460 × 870	801 × 480 × 942	356
48V300Ah	Single-layer vertical	1818 × 460 × 341	1878 × 480 × 409	485
	Double-layer vertical	913 × 460 × 870	1002 × 480 × 942	491
48V400Ah	Single-layer vertical	2508 × 413 × 341	2568 × 433 × 409	628
	Double-layer vertical	1258 × 413 × 870	1347 × 433 × 942	638
48V500Ah	Single-layer vertical	2508 × 480 × 341	2568 × 500 × 409	762
	Double-layer vertical	1258 × 480 × 870	1347 × 500 × 942	771
48V600Ah	Single-layer vertical	2508 × 547 × 341	2568 × 567 × 409	883
	Double-layer vertical	1258 × 547 × 870	1347 × 567 × 942	892
48V800Ah (Two sub-racks)	Single-layer vertical 1	5116 × 379 × 341	5248 × 399 × 409	1210
	Single-layer vertical 2	2508 × 858 × 341	2584 × 878 × 409	1210
	Double-layer vertical	2536 × 379 × 870	2655 × 399 × 942	1213
48V1000Ah (Two sub-racks)	Single-layer vertical 1	5116 × 446 × 341	5248 × 466 × 409	1498
	Single-layer vertical 2	2508 × 992 × 341	2584 × 1012 × 409	1498
	Double-layer vertical	2536 × 446 × 870	2655 × 466 × 942	1510
48V1600Ah (two sub-racks in on layer)	Single-layer vertical	4584 × 722 × 428	4824 × 742 × 491	2666
	Double-layer vertical	2292 × 722 × 1082	2532 × 742 × 1145	2640
48V2000Ah (two sub-racks in on layer)	Single-layer vertical	4584 × 856 × 428	4824 × 876 × 491	3270
	Double-layer vertical	2292 × 856 × 1082	2532 × 876 × 1145	3244
48V3000Ah (Two sub-racks)	Single-layer vertical	4584 × 1221 × 428	4824 × 1336 × 491	4744
	Double-layer vertical	2292 × 1316 × 1082	2532 × 1336 × 1145	4735

> Four-layer horizontal (48V200~1000Ah)

Model	Installation config.	Rack specifications L × W × H (mm)	MAX specifications L × W × H (mm)	Total weight (Kg) Battery included
48V200Ah	Four-layer horizontal	722 × 360 × 914	842 × 381 × 914	352
48V300Ah	Four-layer horizontal	923 × 360 × 914	1043 × 381 × 914	499
48V400Ah	Four-layer horizontal	1127 × 360 × 914	1247 × 381 × 914	646
48V500Ah	Four-layer horizontal	1328 × 360 × 914	1448 × 381 × 914	769
48V600Ah	Four-layer horizontal	1529 × 360 × 914	1649 × 381 × 914	893
48V800Ah	Four-layer horizontal	2088 × 360 × 914	2208 × 381 × 914	1254
48V1000Ah	Four-layer horizontal	2490 × 360 × 914	2610 × 381 × 914	1517

> Six-layer horizontal installation (48V200~1000Ah)

Model	Installation config.	Rack specifications L × W × H (mm)	MAX specifications L × W × H (mm)	Total weight (Kg) Battery included
48V200Ah	Six-layer horizontal	494 × 360 × 1354	614 × 381 × 1354	358
48V300Ah	Six-layer horizontal	628 × 360 × 1354	748 × 381 × 1354	506
48V400Ah	Six-layer horizontal	764 × 360 × 1354	884 × 381 × 1354	652
48V500Ah	Six-layer horizontal	898 × 360 × 1354	1018 × 381 × 1354	776
48V600Ah	Six-layer horizontal	1032 × 360 × 1354	1152 × 381 × 1354	899
48V800Ah	Six-layer horizontal	1434 × 360 × 1354	1554 × 381 × 1354	1267
48V1000Ah	Six-layer horizontal	1702 × 360 × 1354	1822 × 381 × 1354	1528

6. Main Performance Curves

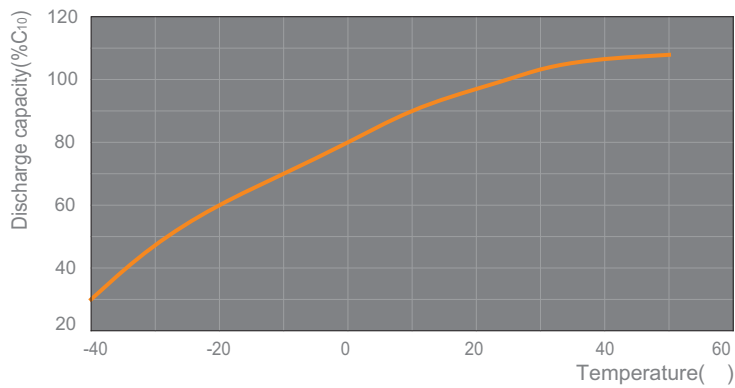
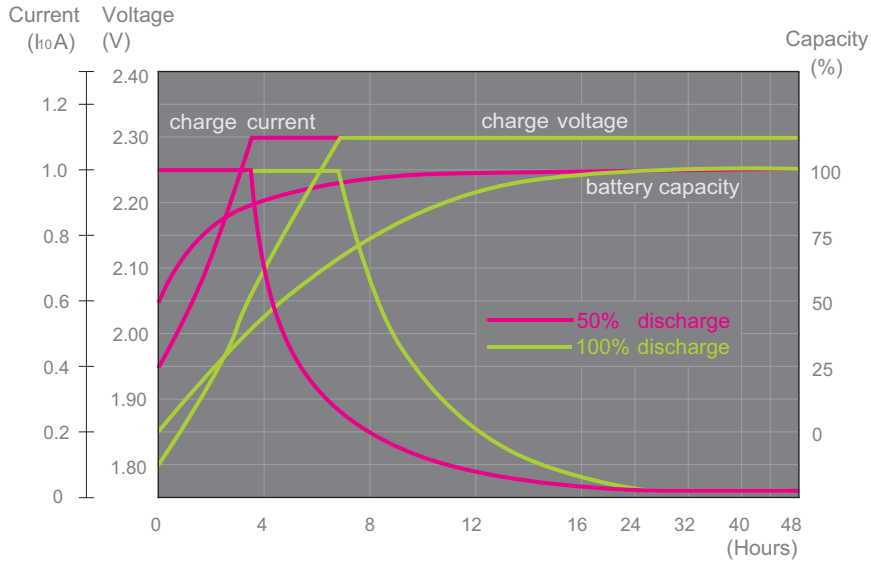


Chart 2: Average charge characteristic curve at different discharge depth & different average charge current (25)

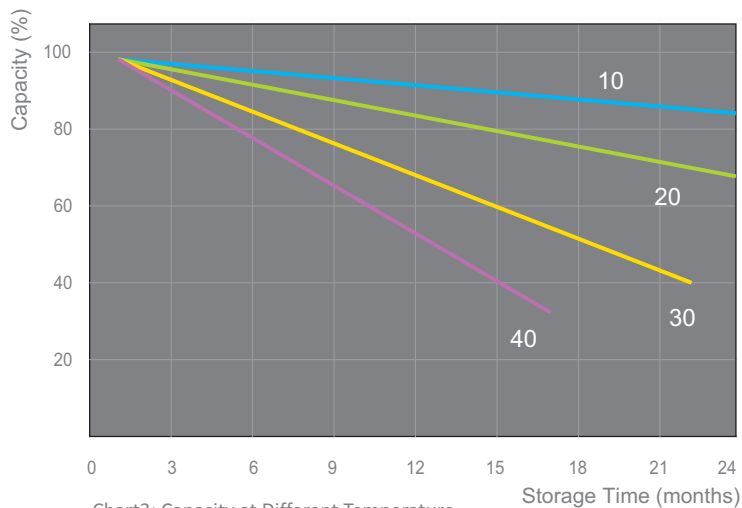


Chart3: Capacity at Different Temperature

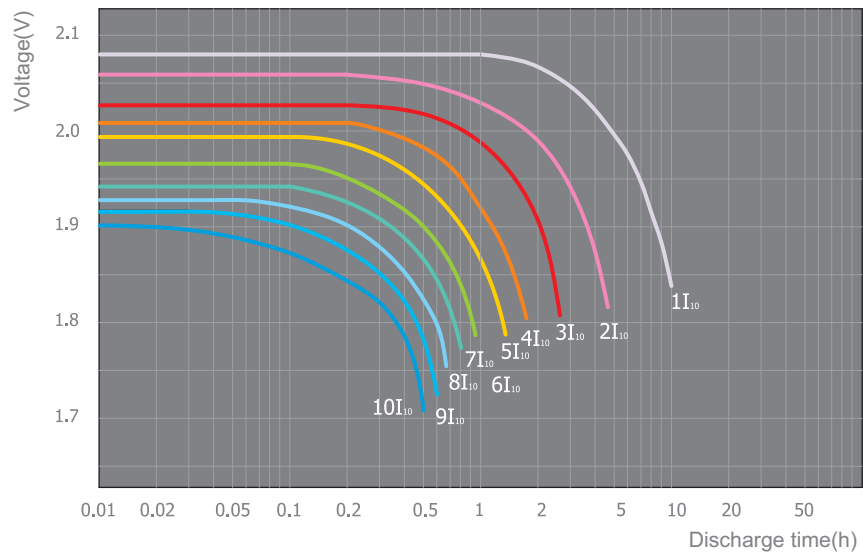


Chart 4. Curve of Storage Time and Self-discharge at Different Temperature

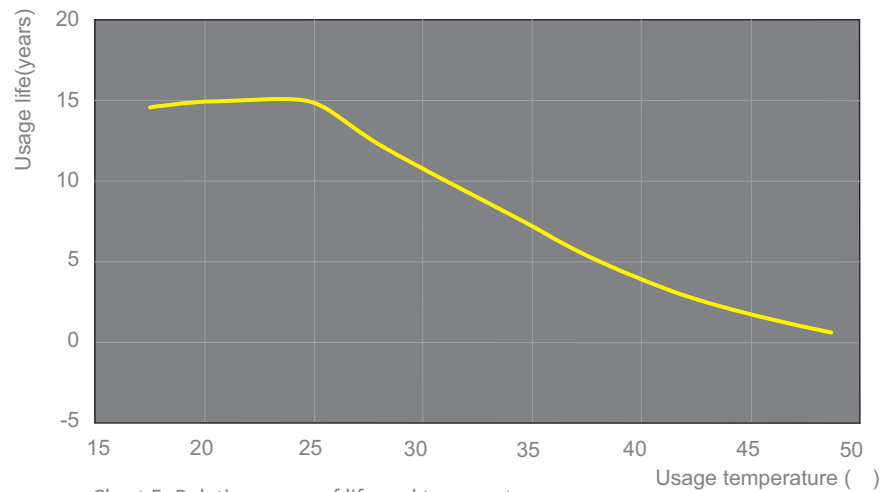


Chart 5: Relation curve of life and temperature

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